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Modelling economic impacts of an epidemic spread of West Nile virus in Belgium

Marie-France Humblet ¹, Sébastien Vandeputte ¹, Fabienne Fecher-Bourgeois ¹, Philippe Léonard ², Christiane Gosset ¹, Thomas Balenghien ³, Benoît Durand ⁴, Claude Saegerman ¹

1: University of Liege, Liege - Belgium

2: University Hospital, Liege - Belgium

3: CIRAD, UMR CMAEE, F-34398, Montpellier - France

4: Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (Anses), Maisons-Alfort - France

Objective: West Nile virus (WNV) is a vector-borne pathogen, member of the genus *Flavivirus* (family *Flaviviridae*). Its main vectors are mosquitoes belonging to the *Culicidae* family, genus *Culex*. The infection is maintained in a bird-mosquito enzootic cycle, and birds, especially passeriforms, are the primary reservoir hosts. Horses and men are considered as accidental dead-end hosts, and considered not to transmit the virus to other mosquitoes. The disease generates clinical signs mainly in horses and humans, while most affected birds are not clinically affected in Europe. The majority of horses remain asymptomatic, and approximately 10% of clinical cases develop neurological signs. In humans, after a two-week incubation period, two main clinical pictures can be observed: a flu-like syndrome and a neuro-invasive form. In Europe, the virus is constantly expanding its geographical distribution and has recently emerged in previously free countries. The present study aimed at estimating, in a prospective scenario, the potential economic impacts of a West Nile virus epidemic in free country such as Belgium, both for the equine sector and for the human health sector.

Methods: The modelling of risk areas, based on the habitat suitable for *Culex pipiens*, allowed determining equine and human populations at risk. Characteristics of the disease based on European past experiences allowed estimating morbidities among horses and humans. Regarding the human health aspect, only short-term costs and losses were estimated for patients who developed the neuro-invasive form of the disease, as no vaccine is available yet.

Results: The economic costs associated with the viral disease per horse were monetary estimated. When considering global estimations, the main costs are related to vaccination, followed by the replacement value of dead/euthanized horses. The costs incurred per patient affected by the neuro-invasive form of the disease, as well as the associated production loss were estimated. Global monetary estimations highlight the important part of hospital costs (64% of total costs), compared to insurance claims paid to the beneficiaries after the death of patients (19% of total costs).

Conclusion: The main costs for the equine sector were prevention measures such as vaccination and replacement value for dead/euthanized horses. Hospital charges would be the major financial consequences of the West Nile virus epidemic in humans. In horses, the choice of the vaccination strategy will have important consequences in terms of costs. The modelling economic impacts of an epidemic spread of West Nile virus in European countries appears to be useful in terms of awareness and to making mitigation measures proactively and appropriately.